

## CHAPTER 11

## HAZARDOUS SUBSTANCES

## 11-1. Environmental protection.

This chapter concentrates on the Environment Protection Agency (EPA) identification of hazardous substances. If a hazardous substance is released into the environment in a reportable quantity the facility Hazardous Waste Coordinator must be notified. "Release" by definition involves any spilling, leaking, pumping, emitting, emptying, discharging, injecting, escaping, dumping or disposing of a hazardous substance. A "reportable quantity" varies by weight for each hazardous substance. Refer to Section 311 of the Clean Water Act (CWA) for established quantities for hazardous substances. For hazardous substances not listed, one (1) pound or more of that substance released to the environment is reportable until otherwise specified by the EPA. Failure to comply with notification requirements may result in civil and criminal penalties. In all cases, handling and disposing of any hazardous substance must be directed by the Site Hazardous Waste Coordinator. Hazardous substances include:

- a. Wastes listed in the Resource Conservation and Recovery Act (RCRA).
- b. Air pollutants listed in the Clean Air Act (CAA)-Section 112.
- c. Substances and priority pollutants listed in the Clean Water Act (CWA)-Sections 311 and 307a.
- d. Chemical substances designated under the Toxic Substances Control Act (TSCA)-Section 7.
- e. Other substances as designated by the EPA

## 11-2. Polychlorinated biphenyls (PCBs).

PCBs belong to a broad family of organic chemicals known as chlorinated hydrocarbons. Virtually all PCBs have been synthetically manufactured. Their use has primarily been in transformers and capacitors but they are also found in fluorescent ballasts. PCBs are no longer intentionally manufactured in the United States although inadvertent production of PCB byproducts can occur when chlorine, organic carbon, elevated temperatures or catalysts are present together in a process. The Monsanto Corporation was the principal domestic manufacturer of PCBs and marketed the product under the trade name, Aroclor. However, other companies who used PCBs in the manufacture of transformers, capacitors, etc. used other trade names (table 11-1). From an electrical standpoint, one desirable feature of PCB is its chemical stabil-

ity. Resistance to degradation by heat, oxidation etc. is very desirable. But it is the long life feature, coupled with the fact that PCB is bioaccumulative and concentrates in the fat tissue of fish and other animals, including man, that has led to its identification as an environmental problem. Handling, storage and disposal of PCBs and products containing PCBs are therefore regulated by the EPA and the Site Hazardous Waste Coordinator. All questions pertaining to hazardous wastes should be directed to that office. Basic concepts have been presented to acquaint facilities personnel with the hazards of PCBs. Physical problems which maybe related to PCB exposure include an acne-like skin eruption associated with baking, soldering or heat transfer applications; changes in skin pigmentation; peripheral numbness; digestive upsets; headaches; and fatigue. PCB has also been found by the Occupational Safety and Health Administration (OSHA) to include tumors in experimental animals after repeated oral ingestion and concludes that PCBs are a potential carcinogen to humans. Unless laboratory tests confirm the presence of less than 50 parts per million (PPM) of PCB, then all transformers or capacitors filled with petroleum-based dielectric are assumed to be PCB-contaminated for EPA regulatory purposes. Sample testing an oil sample involves a comprehensive test, a gas-in-oil test and a presence of PCB test. The gas-in-oil analysis determined the concentrations of gases absorbed in the oil sample. The presence of PCBs analysis determines the concentration of PCBs in the oil sample. Oil classifications and concentrations are: non-PCB—less than 50 PPM; PCB contaminated—greater than 50 PPM but less than 500 PPM and, PCB—greater than 500 PPM. The comprehensive test includes the following analyses:

- a. Dielectric strength.
- b. Color.
- c. Acidity.
- d. Water content.
- e. Viscosity.
- f. Specific gravity.
- g. Pour point.
- h. Interracial tension.
- i. Power factor.
- j. Corrosive sulphur.
- k. Visual examination.
- l. Particle count.

*Table 11-1. Common trade names for PCBs by manufacturers.*

NAME	MANUFACTURER
Aroclor	Monsanto
Asbestol	American Corp.
Askarel	(1)
Chlorextol	Allis Chalmers
Diaclor	Sangamo Electric
Dykanol	Cornell Dubilier
Elemex	McGraw Edison
Hyvol	Aerovox
Inerteen	Westinghouse Electric
No-Flamol	Wagner Electric
Pyranol	General Electric
Saf-T-Kuhl	Kuhlman Electric
Clophen	Bayer (Germany)
DK	Caffaro (Italy)
Fenclor	Caffaro (Italy)
Kennechlor	Mitsubishi (Japan)
Phenoclor	Prodelec (France)
Pyralene	Prodelec (France)
Santotherm	Mitsubishi (Japan)

Note. Generic Trade name use for non-flammable insulating liquids containing PCBs in capacitors and transformers.

### 11-3. Lighting ballast.

Since the capacitor of the ballast in fluorescent lamps contains a small quantity of PCB the EPA has laid out regulations for the disposal of lighting ballast:

*a.* If the PCB lighting ballast is leaking the disposal is regulated under the Toxic Substance Control Act (TSCA). The leaking ballast must be incinerated at an EPA approved incinerator.

*b.* If the PCB lighting ballast is not leaking the disposal is not under the TSCA. Check with your local EPA office to find out any requirements in your area for the disposal.

### 11-4. Flammable liquids and gases.

Flammability is the capability of a substance to ignite easily, burn intensely and spread rapidly. Extreme caution should be taken when storing and handling flammable materials, follow the National Fire Protection Association (NFPA) Standard 251. Of the flammable and combustible liquids and gases in use, the most common are liquid hydrogen, liquified petroleum gas and natural gas (methane).

*a. Hydrogen.* Liquid hydrogen, like other cryogenic liquids, presents a hazard due to its extremely low temperature, and the high pressures that can be generated if it is allowed to evaporate in a confined space. However, the major hazard lies primarily in the wide ranges of flammability and detonability of gaseous hydrogen in air. The principal method of preventing hydrogen gas ignition or detonation is by diluting the gas below the lower limit of flammability and eliminating all sources of ignition. This can be accomplished by:

- (1) Providing adequate ventilation.
- (2) Avoiding areas where pocketing may occur.
- (3) Minimizing confinement.
- (4) Limiting the amount of liquid hydrogen at any one location.
- (5) Using non-sparking tools and explosion-proof equipment.
- (6) Grounding equipment properly.
- (7) Avoiding open flames.
- (8) Observing no-smoking rules.

*b. Liquified petroleum gas (LPG).* LPG is a dangerous fire and explosion hazard when released in air. Vapors may flow along surfaces for substantial distances, reach a source of ignition and flash back. LPG is also an asphyxiant. It is heavier than air, and may accumulate in pits and other low lying areas where it may displace air. Contact with liquified gas can cause frostbite. The following special precautions must be observed:

- (1) LPG must be stored and used in well-ventilated areas, and kept away from heat, ignition sources, and oxygen and chlorine cylinders.

(2) LPG systems shall have approved containers, valves, connectors, manifold valve assemblies and regulators.

(3) LPG systems shall meet all Department of Transportation specifications.

(4) LPG containers and vaporizers shall have at least one approved safety relief valve.

(5) LPG shall not be stored within buildings.

(6) LPG storage locations shall be equipped with at least one 20-B/C rated fire extinguisher.

*c. Natural gas (methane).* Under normal storage and handling conditions, natural gas is stable when contained. But when mixed with air or other oxidizing agents, it readily becomes flammable or explosive. Natural gas is lighter than air and can be an asphyxiant by displacing air. The following precautions must be observed.

- (1) Cylinders must be stored in well ventilated and low fire hazard areas.
- (2) All lines and equipment used with natural gas must be grounded to prevent static sparks.
- (3) Smoking must not be allowed.
- (4) Non-sparking tools must be used.

### 11-5. Toxic materials.

Toxicity is the degree to which a substance will affect living cells under certain conditions. It is dependent upon the dose, rate, method and site of absorption. It is also dependent upon the health, tolerance, diet and temperature of an individual. Physiological effects result from inhalation, ingestion or absorption of a toxic material. To limit this exposure, smoking and eating are not permitted in hazardous areas, and personnel are required to wash their hands thoroughly before eating, smoking or using toilet facilities.

*a. Mercury.* Mercury metal is a distinct hazard because of its property of vaporization at room temperature. The rate of evaporation increases with temperature and with the surface area exposed. This property is of great importance since mercury can seep into human skin. Mercury or metal contaminated with mercury should never be heated without providing exhaust ventilation or approved air respirators.

*b. Solvents.* Special precautions should be taken when working with solvents due to potential toxic affects and flammability characteristics. Protective measures include providing plenty of ventilation or respirators; using rubber gloves, chemical safety goggles, and face shields; and providing for immediate availability of emergency eyewash facilities. Trichloroethylene and perchloroethylene are solvents suspected of being carcinogenic. The use of carbon tetrachloride as a solvent is prohibited. Acute poisoning caused by prolonged inhalation may result in death.